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gymnastics, and will at once exalt his conception of the grandeur, and enlarge his comprehension of the analytic and solvent power, of the higher mathematics. The work shows that its accomplished author, in pursuing his father's arduous path, has not forgotten the slow and measured steps by which alone the pupil can be led up toward the eminence of clear vision on which the teacher stands.

Professor Docharty's work is distinguished equally by condensation and simplicity. With reference to the properties of the circle, it adopts, in common with many recent treatises, the treatment of the circle as a polygon with an infinite number of infinitely small sides, to the exclusion of the unsatisfactory *reductio ad absurdum* of the older treatises. In a very cursory examination of the book, we see nothing that we could wish to have otherwise; and, while there are other manuals of which we can say the same, we are acquainted with none which we should prefer to this.

20.—*Handbook of Railroad Construction; for the Use of American Engineers. Containing the necessary Rules, Tables, and Formulæ for the Location, Construction, Equipment, and Management of Railroads, as built in the United States. With 158 Illustrations.* By GEORGE L. VOSE, Civil Engineer. Boston: James Munroe & Co. 1857. 12mo. pp. 480.

THIS must be an invaluable book to an engineer, and, beyond our expectation, we find it highly interesting, and richly instructive to a non-professional reader. While it covers the entire ground of railway construction and management, and gives all requisite working formulæ with the processes by which they are reached, it shuns technical language wherever it can be avoided, and enters with minuteness and precision into the practical details, which demand the diligent heed of railroad superintendents and directors, and which have a personal interest for all intelligent travellers, who would know the comparative trustworthiness of the materials, structure, and machinery to which they commit their lives. We would say emphatically, that a manual of this sort ought to be in the hands of every man who holds a place of trust in the affairs of any of our railways. We are especially glad to find that the author's leaning is to the prudent rather than to the heroic side of all professional questions. Thus his formulæ are based on one fourth part of the outside strength of materials; his rules for bridge-making, &c. comprise safeguards against even remotely contingent perils; and he furnishes mathematical demonstrations of the

wastefulness and the financial folly of the high rates of speed which have led to so many appalling disasters. We are glad to find our plea for the forests aided by Mr. Vose's decided preference of coke as fuel for locomotives. The grounds for this preference are so manifest and strong, that only the haphazard, irresponsible management which has carried so many of our railroad corporations to, or beyond, the brink of ruin, can persist in a foolish prodigality which threatens to render our whole country as bare as Sahara. Only in one respect can we find fault with this book. It is defaced by errata, which constitute nearly six closely printed pages. The author tells us that he was in Missouri, and could not read his proofs. But some one should have read them, and they do not show even the lowest measure of care. Many of the errata are such as a child could have corrected. For instance, in two consecutive lines we have the startling equations, $44 \times 2 = 80$, and $54\frac{1}{2} \times 3 = 103\frac{1}{2}$. The work will doubtless reach another edition, and, we trust, may then be printed with an accuracy adequate to its merit.

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21. — *Key to the Geology of the Globe: an Essay, designed to show that the present Geographical, Hydrographical, and Geological Structures, observed on the Earth's Crust, were the Result of Forces acting according to fixed, demonstrable Laws, analogous to those governing the Development of Organic Bodies.* By RICHARD OWEN, M. D., Professor of Geology and Chemistry in the University of Nashville. Illustrated by Maps and Diagrams. Nashville: Stevenson and Owen; W. T. Berry & Co. 1857. 8vo. pp. 256.

NATURAL science, in all its departments, has passed the stage of minute analysis, and the work that now remains for its cultivators is the synthesis of its elements and its forces, and the development of analogy or identity where it has been unsuspected. To trace out the filaments of the Divine unity, which blend and diverge, cross and intertwine, through all space and time, is the endeavor of the leading minds, alike in the sciences that girdle the universe, and in those concerned with the formations and organisms of our own planet. Professor Owen's work is a bold and able essay of this type. *Unity of plan and uniformity of causes* are the germinal ideas of his system. He finds in the original condition of the earth and the forces necessarily acting upon it the proximate causes of the series of changes of which it has been the theatre. He traces marks of sameness in the processes of inorganic formation, and of organic life. He refers observed laws of